Progress Report for Year 3 for Proposal GC09-532: DEVELOPMENT OF SUBSEASONAL ENSEMBLE FORECAST TECHNIQUES

29 May 2012

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1a. Results and Accomplishments at NASA/GMAO

We have revised the Ham et al. (2012) manuscript and it has been accepted for publication in the J. of Climate (in press). Considerable additional work was done since the last report to satisfy concerns about the statistical significance of the results (we carried out substantially more hindcasts to increase the ensemble size). The paper now shows very clearly that the empirical singular vector (ESV) - based predictions have a systematically higher skill in predicting the MJO compared to those using a Lagged Average Forecast (LAF) approach, and that the improvement in the skill depends on the phase of the MJO. The ESV is particularly effective in increasing the forecast skill during those phases of the MJO in which the LAF approach has low skill as well as during those times in which the MJO is weak.

Our current focus is on implementing a version of the EMC/GFS model physics into the GEOS-5 model. The purpose is to assess the feasibility of contributing to a multi-model strategy within a single model framework but with multiple physics packages. We are leveraging the considerable work that was already done by M. Suarez and S. Moorthi to implement an earlier version of the GFS physics, though that work was put on hold before achieving a scientifically valid version of the model. The current work is to achieve a working version and to upgrade to the most recent version of the GFS physics and the GEOS-5 model. Work is on-going to debug the model. We also have a commitment from EMC to help in the debugging by carrying out parallel runs with the GFS model.

We are continuing to provide guidance in the ESMF implementation of MOM4 at EMC as needed. The results of a telecon discussion highlighted the need to reconcile the different versions of ESMF being used (GFS is version 3, MOM4 is version 4, NEMS is version 5).

Publication: "Optimal Initial Perturbations for Ensemble Prediction of the Madden-Julian Oscillation during Boreal Winter", Ham, Yoo-Geun, Siegfried Schubert, and Yehui Chang, In press, J. Climate, 2012.

1b. Results and Accomplishments at NOAA/EMC

An Ensemble Transform (ET) scheme has been setup to produce experimental subseasonal (out to 45 days) ensemble forecasts using the operational GFS. A series of runs have been performed and are currently being assessed. A skill assessment of the ability of the ET versus the operational (lagged) CFSv2 subseasonal forecasts for 2010 for the first two weeks has been prepared. The results indicate that the ET has higher skill at this short range. This corroborates the potential for skill gain by using sophisticated ensemble forecasts. An ET scheme with one-way coupling with the ocean is in preparation for testing, while the coupled GFS is still in the works.

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3. Next year's budget:

This is the final year of this proposal.

4. Remaining work:

At NASA:

We will focus on implementing and tuning the GFS physics in the GEOS-5 model. We hope to carry out a subset of hindcasts with the modified GEOS-5 model and compare that to parallel runs with the original GEOS-5 model as well as the GFS model. Based on those results, we will make recommendations on possible new multi-model approaches.

At EMC:

EMC will continue its efforts to put into place a coupled GFS. Once this model is available for experimentation, we plan to perform comparative tests with the CFS (lagged-based) and GEFS (ET-based) operational systems for subseasonal time scales.